having separable bodies forming the vaporization pathway can expose the vaporization pathway for cleaning and maintenance.

EXAMPLE

Liquid Fuel Vaporizer and Combustor

Referring to FIG. **7**, an embodiment of a liquid fuel vaporizer and burner is illustrated comprising a liquid fuel vaporizer **701** and combustor **702**. In the instant embodiment, the vaporization pathway **712** comprises a channel formed between the truncated cavity threads of a second body **714** and the screw threads of a first body **715**. A liquid fuel feed tube **717** feeds fuel to the vaporization pathway **712**. Heat is added to the fuel via an electric heater cartridge **703** inserted into the first body **715**. A temperature probe (not shown) can be place along the vaporization pathway, or elsewhere, to control the vaporization temperature. Vaporized fuel can exit through an outlet, which in the present embodiment comprises a nozzle **704** to jet the fuel into a burner cup **711**. An optional retainer ring **713** can help to further secure the liquid vaporizer assembly and/or to seal the vaporization pathway thereby preventing fuel leakage out of the device from the vaporization pathway **712**.

An impaction plate **710** in the burner cup **711** can prevent fuel from taking a direct pathway out of the burner cup. Oxidant gas enters the combustor **702** through an oxidant gas inlet **708** and is distributed substantially evenly around the perimeter of device. Distribution of the oxidant gas is aided by the pressure drop created by an oxidant gas flow distribution insert **705**. In the present embodiment, the flow distribution insert comprises an annular ring of porous metal foam. The flow distribution insert, which receives heat from the combustion of the fuel, can also serve to preheat the oxidant gas flowing through. The oxidant gas then travels over the outside of the burning cup **711**, which can further preheat the gas, and enters through louvered slots **716** in the burner cup. The louvers can induce swirl in the burner cup to improve fuel-air mixing and reduce radiation heat transfer out of the cup. The burner cup can be tapered to the outlet **709** to further reduce radiation heat losses out of the burner cup. An igniter port **707** can be located downstream from the burner cup to initially ignite the fuel. During exemplary operation, the burner can be started at low flow with a rich mixture that allows the flame to flash back from the igniter into the burner cup. Following ignition, the flows can be increased. Combustion gases are expelled through a combustion gas exit **706**. In some embodiments, the heat from the combustion gas can be recycled by routing the combustion gas to a heat exchanger and/or to the liquid vaporizer region.

While a number of embodiments of the present invention have been shown and described, it will be apparent to those skilled in the art that many changes and modifications may be made without departing from the invention in its broader aspects. The appended claims, therefore, are intended to cover all such changes and modifications as they fall within the true spirit and scope of the invention.

We claim:

1. A liquid vaporizer and a combustion chamber, comprising:

a first body having a cross sectional shape and dimensions substantially equal to the cross sectional shape and dimensions of a cavity in a second body, thereby allowing the first body to be non-permanently inserted into the second body, wherein the outer surface of the first body, the inner surface forming the cavity in the second body, or both is modified to create a vaporization pathway between the first and second bodies when the surfaces mate;

a vaporization pathway inlet for fluid comprising a liquid fuel;

a vaporization pathway outlet for fluid comprising primarily vapor, the vaporization pathway outlet in fluid communication with the combustion chamber: and

a heater in thermal communication with the first body, the second body, or both;

wherein the heater actively controls the temperature of the vaporization pathway, the liquid fuel is vaporized prior to introduction into the combustion chamber, the temperature of the vaporization pathway is actively controlled as a substantially independent operating parameter, and oxidant gas flowing to the combustion chamber is preheated by flowing over at least a portion of the exterior of the combustion chamber.

2. A liquid vaporizer and a combustion chamber, comprising:

a first body having a cross sectional shape and dimensions substantially equal to the cross sectional shape and dimensions of a cavity in a second body, thereby allowing the first body to be non-permanently inserted into the second body wherein the outer surface of the first body, the inner surface forming the cavity in the second body, or both is modified to create a vaporization pathway between the first and second bodies when the surfaces mate;

a vaporization pathway inlet for fluid comprising a liquid fuel;

a vaporization pathway outlet for fluid comprising primarily vapor, the vaporization pathway outlet in fluid communication with the combustion chamber;

a heater in thermal communication with the first body, the second body, or both, wherein the heater actively controls the temperature of the pathway, liquid fuel is vaporized prior to introduction into the combustion chamber, the temperature of the vaporization pathway is actively controlled as a substantially independent operating parameter; and

a flow distribution insert providing flow distribution of oxidant gas flowing to the combustion chamber, wherein the insert is located in a flow path of the oxidant gas upstream from the combustion chamber.

3. The liquid vaporizer as recited in claim **2**, wherein the flow distribution insert is thermally conductive and has a large surface area for enhanced heat transfer to the oxidant gases.

4. The liquid vaporizer as recited in claim **2**, wherein the flow distribution insert comprises a thermally conductive foam.

5. A liquid fuel vaporizer and burner comprising a vaporization pathway and a heater providing active control of the temperature of the vaporization pathway independently from the operating rate of the liquid fuel burner, wherein liquid fuel is vaporized in the vaporization pathway prior to introduction into a combustion chamber, which combustion chamber is in fluid communication with the vaporization pathway, wherein active control of the temperature of the vaporization pathway occurs over an operating range turndown ratio of up to at least 5 to 1.

6. The liquid fuel vaporizer and burner as recited in claim **5**, wherein active control of the temperature of the vaporization pathway occurs over an operating range turndown ratio of up to at least 10 to 1.